GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced Mechanics of Marine Structures I, PG_00051723		
Field of study	Ocean Engineering		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2022/2023
Education level	second-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	English
Semester of study	1	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Faculty of Ocean Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Bogdan Rozmarynowski	
	Teachers	dr hab. inż. Bogdan Rozmarynowski	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	0.0	0.0	45
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	45	0.0	0.0	45

Subject objectives	Understanding the phenomenon of sea wave - wind - subsoil - structure interaction problems, structural dynamics with deterministic and non-deterministic (random variables, stochastic procersses) loadings , time and spectral analysis specific for marine structures

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U06] when forming and solving design tasks can see their non-technical aspects, including environmental, economical and legal ones. Applies HSE rules and regulations	The student identifies, classifies and adequately defines events in ocean engineering facilities and systems, taking into account non-technical aspects, especially the marine environment	[SU3] Assessment of ability to use knowledge gained from the subject
[K7_W07] has knowledge on the development perspectives of ocean technology objects and systems, knows the newest and most relevant achievements in ocean technology	The student learns about the technologies of obtaining hydrocarbons from the bottom of the seas and oceans in the context of the fuel situation in the world and knowledge of modern ocean engineering achievements	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
[K7_U04] can apply mathematical methods and models and computer simulations to analyse, design, and assess the functioning of ocean technology objects and systems and their elements	The student uses the mathematical apparatus related to the statics and dynamics of models in deterministic and stochastic terms and equipped with the ability to use advanced computer systems in the field of FEM.	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K7_U07] in compliance with a formulated specification and with the aid of appropriate tools and methods, is able to complete an advanced engineering task within the range of design, construction and operation of ocean technology objects and systems	The student uses an advanced mathematical apparatus related to the use of structural static and dynamic models in deterministic and stochastic terms as the basis for using appropriate methods and tools in a complex engineering task in the field referred to in this point	[SU2] Assessment of ability to analyse information
[K7_W05] has an organized, widened knowledge on design, construction and operation of ocean technology objects and systems	The student uses a mathematical apparatus that takes into account the static and dynamic solutions of the structure models in deterministic and random terms as the basis for extended knowledge in the above-mentioned	[SW2] Assessment of knowledge contained in presentation
[K7_W06] has an organized, widened knowledge on engineering methods and design tools allowing the conducting of advanced projects within the construction and operation of ocean technology objects and systems	The student is able to formulate and solve problems according to the FEM philosophy.	[SW1] Assessment of factual knowledge

Subject contents

1. Literature oveview, defintion of marine and offshore structures, ocean engineering technology and mechanical aspects, structural systems applied, jack-up platforms (Petrobaltic) drilling and structural elements. 2. Tensor algebra fundamentals, stress and small strain states of a solid, constitutive relations. 3. SDOF and MDOF dynamic systems, damping and added masses in offshore vibrations, generalised eigenvalue problem, forced vibrations in offshore engineering. 4. Random variables, stochatic processes, random fields, random excitations. 5. Wind, waves and sea current - description, wind - sea waves structure subsoil - interaction problems. 6. Wind and sea - wave loads, spectral approach. 7. Stiffness and damping properties of soil, foundations of offshore structures. 8. Numerical examples based on the Petrobaltic platform structural data

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
The final test	60.0%	60.0%
Homework	60.0%	40.0%

Recommended reading

Basic literature

1. S. Chakrabarti: Handbook of offshore engineering. Vol. I, II. Elsevier 2005
2. Case J.: Strength of Materials and Structures. 4th edition, John Wiley 1999 (Knovel, GUT eLibrary).
3. I. Karnovsky, O. Lebed: Advanced Methods of Structural Analysis. Springer 2010 (Springer, GUT eLibrary).
4. N.D. Barltrop, A.J. Adams: Dynamics of fixed marine structures. Butterworth Heinemann 1991
5. J.F. Wilson: Dynamics of offshore structures. John Willey & Sons 2003

	Supplementary literature	1. R.W. Clough, J. Penzien: Dynamics of structures. McGraw-Hill, 1993 2. A. K. Chopra: Dynamics of structures. Prentice Hall 1995 3. Sadd M.H. *Elasticity theory, applications and numerics*. Elsevier, Oxford 2
	eResources addresses	Podstawowe https://app.knovel.com/hotlink/toc/id:kpHOEV0001/handbook-offshore-engineering/handbook-offshore-engineering - Two volumes of theoretical and practical issues concerning the systems of sea-going objects Uzupełniające Adresy na platformie eNauczanie: Advanced Mechanics of Marine Structures I, MSc, Summer 2022-2023, [L,T], PG_00051723 - Moodle ID: 29686 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29686
Example issues/ example questions/ tasks being completed	Mention and briefly describe MODU structures Describe the Morison's equation for an elastic pile	
Work placement	Not applicable	